NORTH ATLANTIC TREATY ORGANIZATION
ORGANISATION DU TRAITE DE L'ATLANTIQUE NORD

MILITARY AGENCY FOR STANDARDIZATION (MAS)
BUREAU MILITAIRE DE STANDARDISATION (BMS)
1110 BRUSSELS

MAS/33-MMS/4235
29 January 1993

To : See MAS Distribution List No. 2

Subject : STANAG 4235 MMS (EDITION 1) - ELECTROSTATIC ENVIRONMENTAL CONDITIONS AFFECTING THE DESIGN OF MATERIEL FOR USE BY NATO FORCES

Reference : AC/310-D/56 dated 20 August 1986

Enclosure : STANAG 4235 (Edition 1)

1. The enclosed NATO Standardization Agreement which has been ratified by nations as reflected in page iii is promulgated herewith.

2. The reference listed above is to be destroyed in accordance with local document destruction procedures.

3. AAP-4 should be amended to reflect the latest status of the STANAG.

ACTION BY NATIONAL STAFFS

4. National staffs are requested to examine page iii of the STANAG and if they have not already done so, to advise the Defence Support Division, IS, through their national delegation as appropriate of their intention regarding its ratification and implementation.

E. STAI
Major-General, NOAF
Chairman, MAS

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MAS33A

STANAG 4235
(Edition 1)

NORTH ATLANTIC TREATY ORGANIZATION

(N A T O)

MILITARY AGENCY FOR STANDARDIZATION

(M A S)

STANDARDIZATION AGREEMENT

SUBJECT: ELECTROSTATIC ENVIRONMENTAL CONDITIONS AFFECTING THE DESIGN OF MATERIEL FOR USE BY NATO FORCES

Promulgated on 29 January 1993

E. STAI
Major-General, NOAF
Chairman, MAS

RECORD OF AMENDMENTS

No.	Reference/date of amendment	Date entered	Signature

EXPLANATORY NOTES

AGREEMENT

1. This NATO Standardization Agreement (STANAG) is promulgated by the Chairman MAS under the authority vested in him by the NATO Military Committee.

2. No departure may be made from the agreement without consultation with the tasking authority. Nations may propose changes at any time to the tasking authority where they will be processed in the same manner as the original agreement.

3. Ratifying nations have agreed that national orders, manuals and instructions implementing this STANAG will include a reference to the STANAG number for purposes of identification.

DEFINITIONS

4. Ratification is "The declaration by which a nation formally accepts the content of this Standardization Agreement".

5. Implementation is "The fulfilment by a nation of its obligations under this Standardization Agreement".

6. Reservation is "The stated qualification by a nation which describes that part of this Standardization Agreement which it cannot implement or can implement only with limitations".

RATIFICATION, IMPLEMENTATION AND RESERVATIONS

7. Page iii gives the details of ratification and implementation of this agreement. If no details are shown it signifies that the nation has not yet notified the tasking authority of its intentions. Page iv (and subsequent) gives details of reservations and proprietary rights that have been stated.

NATO STANDARDIZATION AGREEMENT
(STANAG)

ELECTROSTATIC ENVIRONMENTAL CONDITIONS AFFECTING THE DESIGN OF MATERIEL FOR USE BY NATO FORCES

Annexes: A.Electrostatic Charge/Discharge Levels
B.Data Sources (for information)

Related Documents: STANAG 4239 - Electrostatic Discharge Test Procedures to Determine the Safety and Suitability for Service of EEDs and Associated Electronic Systems in Munitions and Weapon Systems.

AIM

1. The aim of this STANAG is to define the worst case electrostatic environment (electrostatic charge level):

   a. which can be developed while handling or when transporting materiel and particularly munitions containing electro-explosive devices (EEDs) and which may be discharged through munitions during NATO operations;

   b. to be used as design criteria for all new munitions and weapon systems intended for use by NATO forces.

AGREEMENT

2. Participating nations agree:

   a. that the electrostatic charge levels developed under the conditions defined in Annex A may be encountered during NATO operations;

   b. to specify the electrostatic charge/discharge levels, as defined in Annex A as design criteria for all new munitions and weapon systems containing EED intended for use by NATO forces.

DEFINITIONS

3. The following definitions are used for the purpose of this agreement only:

a. Electrostatic Charge Level - The electrostatic charge acquired by personnel or materiel involved in NATO operations. This charge Q (Coulombs) = CV where C is the capacitance of the individual or material and V is the voltage acquired. The energy stored, J (Joules) = $0.5\ CV^2$

b. Electrostatic Discharge - A transfer of Electrostatic charge between bodies of different electrostatic potentials caused by direct contact or voltage breakdown between them.

IMPLEMENTATION OF THE AGREEMENT

4. This STANAG is implemented when a nation has issued the necessary order/ instruction that all the new munitions and weapons systems containing EEDs procured for its forces will be designed to remain safe and reliable when exposed to the electrostatic charge/discharge levels defined in this agreement.

ELECTROSTATIC CHARGE/DISCHARGE LEVELS

1. BACKGROUND

1.1 Virtually all modern weapons contain one or more electrically actuated explosive devices which are used to initiate a variety of functions such as rocket motor ignition, warhead detonation, power cartridge actuation, stores ejection etc. Such devices are generally referred to as electro-explosive devices (EEDs). These EEDs may be controlled by conventional circuitry or by solid state technology including integrated circuit transistors and diodes. These solid state sub-assemblies may be mounted on printed circuit boards (PCBs).

1.2 For the past decade or so electromagnetic radiation has received more attention as a hazard associated with the use of EEDs than has the hazard associated with electrostatic discharge. Through a normal logistic cycle weapons undergo various phases of handling such as crating, uncrating, wrapping in protective plastics or other covering, removal from these protective covers, assembling, transporting, loading, downloading etc. These various processes may result in the development of an electrostatic charge on the handlers, transfer equipment, shipping containers, the munitions or weapon systems themselves, or any other ungrounded object. This charge or voltage if transferred into the munition or weapon system may be sufficient to change logic states, result in component destruction or in the case of EEDs exceed the threshold level for firing. Such a discharge could result in a malfunctioning or dudding of the munition or weapon system or cause a catastrophic ignition of a propellant or other explosive depending on the function of the affected components(s) or EED(s).

1.3 The use of plastics and plastic-like materials (notorious for their ability to generate and retain electrostatic charges) for environmental protection during shipping and storage has increased the hazards from electrostatic discharge during the handling of modern munitions and weapon systems. Accidents have been proven attributable to the use of plastics in close proximity to munitions and weapon systems. Equally hazardous is the use of synthetic fibers, such as nylon and polyester clothing worn by personnel handling munitions. Another factor which contributes to the hazards of electrostatic discharge is the use of helicopters in vertical replenishment.

2. ELECTROSTATIC ENVIRONMENT (CHARGE/DISCHARGE LEVELS)

2.1 The electrostatic environment (charge/discharge levels) likely to be encountered by materiel and particularly by munitions and weapon systems containing EEDs during handling, transportation or deployment within NATO are given in Table 1. The helicopter produces the highest electrostatic voltage level for all types of vehicles considered in the transportation mode.

Table 1

CONDITION	PARAMETERS			
	ELECTRO-STATIC VOLTAGE(kV)	CAPACITANCE (PICOFARADS)	CONTACT RESISTANCE (OHMS)	DISCHARGE INDUCTANCE (MICROHENRIES)
HANDLING	25	500	5000-500	<5
TRANSPORTATION (Helicopter)	300	1000	0	<20

DATA SOURCES

(for information)

France	GEMO/FMD 471A1	
	GEMO/FMD 471B1	
	GEMO/FMD 471C1	
	MIL-STD-1512	
Germany	VG95378 Part II	
United Kingdom	BS 5958 Pt 1 and Pt 2	
	ERDE Report No. 22/R/56	
	ERDE Report No. 18/R/62	
United States	MIL-STD-1512	USAF
	MIL-S-23659C	US
	AMCP 706-235	USA
	AFSC DH 1-4	USAF
	NAVSEA OD 10773	USN
	MIL-STD-331	US
	MIL-STD-810D	USN
	DOD HDBK 263	DOD
	NAVSEA DD 44811	USN

RATIFICATION AND IMPLEMENTATION DETAILS
STADE DE RATIFICATION ET DE MISE EN APPLICATION

NATION	NATIONAL RATIFICATION REFERENCE DE LA RATIFICATION NATIONALE	NATIONAL IMPLEMENTING DOCUMENT NATIONAL DE MISE EN APPLICATION	IMPLEMENTATION/MISE EN APPLICATION					
			FORECAST DATE DATE PREVUE			ACTUAL DATE DATE REELLE		
			NAVY MER	ARMY TERRE	AIR	NAVY MER	ARMY TERRE	AIR
BE								
CA	Will not ratify/ ne ratifie pas							
DA	M.204.69-S 4235/MAS ARMY-31194 of/du 18.12.86					1.94	1.94	1.94
FR	200740177 DASA/MMS of/du 23.12.92					1.93	1.93	1.93
GE	BMVg Fü S IV 1 Az 03-51-60 of/du 15.1.87		5.93	5.93	5.93			
GR								
IT								
LU								
NL	M90/0198/5198 of/du 1.8.90		1.93	3.93	1.93			
NO								
PO								
SP								
TU								
UK*	D/D Stan/341/8/4235 of/du 11.10.89	DEF STAN 00-35				1.93	1.93	1.93
US*	Ltr AMCICP-AA(34-1d) of/du 20.12.88	MIL-STD-1512				1.93	1.93	1.93

***See reservation overleaf/**
Voir réserve au verso

RESERVATIONS/RESERVES

UNITED KINGDOM : The United Kingdom has the following reservation : Levels obtained during transportation including mechanical handling may exceed those quoted and each case must be considered on its merits.

ROYAUME-UNI : Le Royaume-Uni émet la réserve suivante : Les niveaux obtenus pendant le transport, y compris pendant les manutentions mécaniques, peuvent dépasser les valeurs citées et chaque cas doit être examiné séparément.

UNITED STATES : The USAF will apply the handling environment only to those electro-explosive devices that are required to comply with MIL-STD-1512, Test Method 205. The transportation environment will always be tailored and when used will be applied only to electro-explosive devices and munitions in their approved shipping containers.

ETATS-UNIS : Les forces aériennes des Etats-Unis appliqueront les conditions de manutention seulement aux dispositifs électropyrotechniques qui doivent être conformes à la méthode d'essai 205 de la norme MIL-STD-1512. Les conditions de transport seront toujours adaptées et, lorsqu'elles seront appliquées, elles ne seront utilisées que pour des dispositifs électropyrotechniques et des munitions se trouvant dans leurs conteneurs d'expédition approuvés.